EFS-3

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EFS - 3
E FIELD SENSOR

OPERATING AND MAINTENANCE
INSTRUCTIONS

FOR

INSTRUMENTS FOR INDUSTRY, INC.
E FIELD SENSOR
MODEL NUMBER EFS-3

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SECTION 1.0

INTRODUCTION

Congratulations on the purchase of your new Electric Field Sensor from Instruments For Industry, Inc. Your new Electric Field Sensor, or E Field Sensor, represents a highly versatile, economical test instrument for measuring electronic fields within the frequency range of 10 kHz to 220 MHz. Your E Field sensor's quality, performance and trouble free operation depends on you thoroughly reading through this manual and familiarizing yourself with its proper operation and usage in order to obtain accurate and repeatable measurements.

Your E Field sensor comes with the following accessories, be sure to check your packaging for the items listed below before disposing of the packaging.

CONTENTS

(For a typical EFS-3 E Field Sensor)

Quantity	Description
1	EFS-3 Electric Field Sensor
1	Antennas, Set
	1 Long Antenna (approx. 5.00 inches)
	1 Middle Antenna (approx. 1.00 inches)
	1 Short Antenna (approx. 0.38 inches)
	1 Antenna container with two end caps
1	Operation and Instruction Manual
1	AC Battery Charger
1	Certification of Calibration
1	Pulse Calibration Curve

SECTION 2.0

GENERAL DESCRIPTION

The EFS-3 Electric Field Sensor, or E Field sensor, is a highly versatile self-contained test measurement instrument that measures electric fields from 10 kHz to 220 MHz. The EFS-3 E Field Sensor also allows reading field strength directly in volts per meter (V/M) and is capable of measuring electronic fields up to 300 V/M using the standard integral antennas provided with the unit.

The EFS-3 is designed to be compact and is powered by a NICAD rechargeable battery. Because of it's compact size, the physical presence of the sensor with in the electronic field to be measured would have a negligible effect on the field itself. When using the standard internal antennas, no band switching, tuning or other frequency adjustments are required when operating this unit.

The EFS-3 is designed to measure peak voltages over the entire operating frequency range of 10 kHz to 220 MHz. These measurements can be obtained in either the CW (Constant Wave) or Pulse mode operations. The EFS-3 also measures the peak wave form of any modulated wave with a carrier frequency above 1 MHz. Should measurements below 1 MHz be required, a Calibration Curve with the frequency roll of is provided so corrections could be calculated.

A common and desired option for the E Field Sensor is the optional Light Modulator Transmitter, or LMT, for remote reading and control. The LMT utilizes fiber optic data links to avoid distortion and erroneous readings due to the presence of conductive interconnecting cables. The optional LMT is also recommended for remote readings when E Field levels are too severe and prolonged exposure may be harmful to the operator. The LMT option mounts conveniently to the bottom of the E Field Sensor and has it's own rechargeable battery power source. Refer to Section 8.0, Accessories And Options for more information regarding the LMT and other beneficial accessories.

SECTION 3.0

WARRANTY INFORMATION

Instruments For Industry, Inc. (IFI) warrants each product of its manufacture to be free from any defect in material and workmanship for a period of one year from shipment to the original purchaser. All warranty returns, however, must first be authorized by our factory office representative. Refer to the Service Section for information on how to return items for warranty repair.

Warranty liability shall be limited to repair or replacement of, or part thereof, which proves to be defective after inspection by IFI. This warranty shall not apply to any IFI product that has been disassembled, modified, physically or electrically damaged or any product that has been subjected to conditions exceeding the applicable specifications or ratings.

IFI shall not be liable for any direct or consequential injury, loss or damage incurred through the use, or the inability to use, any IFI product.

IFI reserves the right to make design changes to any IFI product without incurring any obligation to make the same changes to previously purchased units.

This warranty is the full extent of obligation and liability assumed by IFI with respect to any and all IFI products. IFI neither makes, nor authorizes any person to make, any other guarantee or warranty concerning IFI Products.

SECTION 4.0

WARNING

TO THE USER REGARDING

ELECTROMAGNETIC RADIATION

The E Field Sensor is intended to measure electric fields that may or may not be hazardous to the user. Review and adhere to all safety precautions and procedures when exposing the user to potentially hazardous electromagnetic radiation.

IFI provides options and accessories that, when used in conjunction with the E Field Sensor, can allow the user to measure electronic fields remotely without exposing the user to the actual electronic fields. Refer to Section 8.0, Accessories And Options for more details.

SECTION 5.0

CARE AND MAINTENANCE

Your E Field Sensor is a precision measuring device of electronic field intensities and should be handled like any other delicate instrument - with care and good handling practices.

Provided below are some precautions that should be observed when operating your sensor and some "common sense" practices to maintain accurate and repeatable measurements.

5.1 Avoid The Following Conditions:

Do not drop the sensor
Do not pick up the unit by the antenna
Do not bend the antennas
Do not expose the sensor to extreme temperatures
Do not mix antennas with other E Field Sensors - See Paragraph 5.2 for details

5.2 Avoid Mixing Antennas

Each antenna is matched to a particular E Field Sensor and the antenna container is serialized with the same serial number as the matched E Field Sensor. It is important to return the antennas to the proper container as soon as it is removed from the sensor to avoid any possible confusion.

It is recommended that if your facility is in the possession of several E Field Sensors and since all the antennas are similar in appearance, color code each antenna set with brush on paint to avoid any potential mixing of matched antennas. This precautionary step will pay for itself on the first test that is performed using multiple sensors.

5.3 Battery Care And Maintenance

The E Field Sensor incorporates an internal Nicad Rechargeable Battery that should be charged for a minimum of 8 hours prior to being used. With the E Field Sensor fully charged, the battery should provide 10 hours of service.

To recharge the E Field Sensor internal Nicad Rechargeable Battery, the Power Switch must first be switched to the "OFF" position. Plug the supplied AC Battery Charger into a 115 VAC wall outlet and insert the plug into the "BATT. CHG." jack on rear panel.

Note: *The AC Charger can operate from either a 115 VAC or a 230 VAC source, a small switch located on the charger can be switched to the appropriate AC source. Make sure this switch is in the appropriate position prior to using the charger.*

5.4 Operational Check

The following Operation Check procedure is intended to provide the user with a simple and effective method to verify proper performance and responsiveness of the sensor prior to taking any measurements. Refer to the EFS-3 Illustration of Figure 1.0 when reviewing the functions described below.

Operational Check Procedure

Step (1) With the unit turned 'OFF' and placed on a level flat surface, verify that the meter indicates a zero reading. If the meter requires adjustment, use the mechanical zero adjustment screw located on the lower middle section of the meter movement.

Step (2) Set the Range Switch to LOW scale reading.

Step (3) Set the Function Stitch to the CW position.

Step (4) Turn the sensor 'ON' by positioning the Power Switch in the UP position.

Step (5) Adjust the meter for a zero indication using the 'METER ZERO' located on the back panel.

Step (6) Install the Long Antenna.

Step (7) Allow the sensor to be free standing and without holding the sensor chassis, gently tap the antenna with one hand. Observe the meter movement as you tap the antenna and note that the meter swings to a greater than full scale indication with each tap.

Step (8) If the meter conforms to Step (7), the sensor is operating normally.

If the sensor does not respond to Step (7), check the batteries for proper voltages.

If the batteries voltages are correct, return the sensor for servicing as per the instructions of Section 10 herein.

5.5 Trouble Shooting

In the event that the E Field Sensor may exhibit a possible malfunction condition, review the Trouble Shooting steps below before returning the sensor for repair.

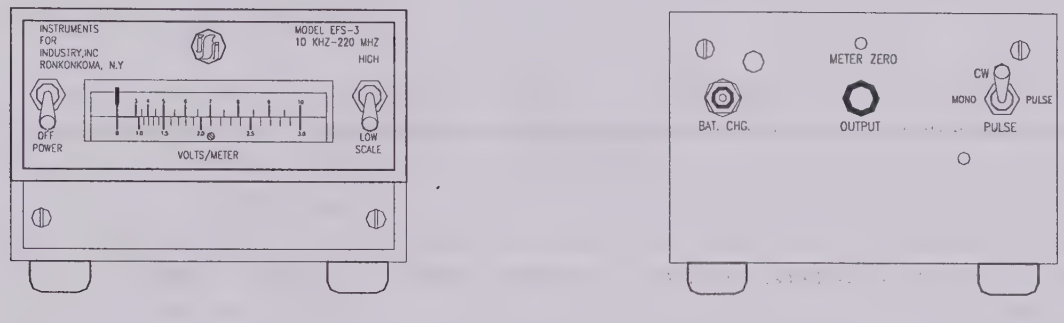
5.5 Trouble Shooting - continued

Problem:	Check For:
• The meter indicates full scale all the time	• Recharge the NICAD Battery • Adjust 'Meter Zero' on rear panel to zero and perform Operational Test of Paragraph 5.4
• The meter will not reach full scale	• Recharge the NICAD Battery
• The meter does not respond to E Fields	• Ascertain that the E Fields are actually present • Perform Operational Test of Paragraph 5.4, if the sensor does not conform, return sensor for service
• Meter Zero not functioning	• Recharge the NICAD Battery • Return for service

SECTION 6.0

FUNCTIONAL DESCRIPTION

This section will address and familiarize you with each of your E Field sensors' many versatile functions before the we proceed with detailed instructions on its operation. Refer to the EFS-3 Illustration of Figure 1.0 when reviewing the functions described below.



FRONT PANEL

REAR PANEL

FIGURE 1.0
EFS-3 ILLUSTRATION

6.1 FRONT PANEL

The following are descriptions of all the features located on the front panel.

6.1.1 Power Switch

The Power Switch is located on the left side of the Front Panel. This switch deactivates the E Field Sensor when placed in the 'OFF' position. To activate the sensor, position the switch in the up position.

6.1.2 Range Selector Switch

The Range Selector Switch has two positions which provides the user with two sensitivity ranges for electronic field measurement. The Range Selector Switch changes the scaling of the meter so that accurate measurements could be obtained in accordance with the respective field intensities to be measured.

6.1.3 Meter

The Meter provides a finite indication in Volts Per Meter (V/M) of the electronic field intensity measured by the E Field Sensor. The Meter indication is directly dependent on the Sensitivity Switch setting and the applicable Antenna Length being used to measure the electronic field. It is mandatory to know which antenna is used and what position the Sensitivity Switch is in to determine the correct field strength measurement.

1) The Sensitivity Switch Setting

The Meter has two scales displayed on the face of the meter which is divided horizontally in half. The upper scale which measures within the range of 0 to 10 V/M and the lower scale which measures from 0 to 3.0 V/M. The Sensitivity Switch changes the sensitivity of the E Field Sensor and the corresponding scale on the meter must be referenced for the correct reading. For example refer to Figure 2.0 where the meter is indicates a mid scale reading. Without knowing the Sensitivity Switch setting, the indication could be either 7.0 V/M or 2.1 V/M. It would appear that Figure 2.0 illustrates 7.0 V/M due to the Sensitivity Switch being set in the 'HIGH' position, however, the user must always consider the antenna length before deriving the actual reading. A convenient reference label attached to the side of the E Field Sensor illustrates the appropriate range selection based on witch antenna is used and the position of the Sensitivity Switch.

Note: *Due to the nature of the square law, the graduations at the lower end of the scale are more compressed than at the upper range of the scale, therefore using the 3V/M scale for readings below 1V/M or using the 10V/M for readings below 3V/M is not recommended for obtaining the best possible accuracy. Better accuracy can be obtained by using the appropriate antenna factors or range settings to manipulate the indications to be in the upper range thus obtaining the best possible accuracy of measurements.*

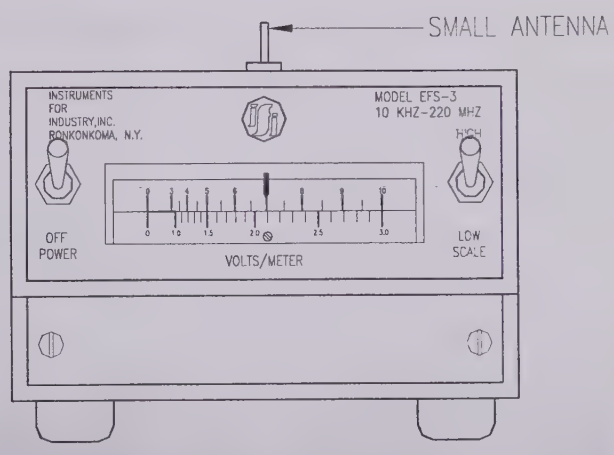


FIGURE 2.0
EFS-3 METER

2) Antenna Length

When using one of the three antennas provided with the E Field Sensor, it is important to use the appropriate range that corresponds to each antenna. Figure 3.0 represents the Full Scale Range Label that is conveniently attached to the side of the E Field Sensor. Refer to Figure 3.0 for the appropriate range selection based on witch antenna is used and the position of the Sensitivity Switch.

Each antenna provided with the E Field Sensor has a different characteristic due to the physical length of each antenna. The longest antenna is approximately 5.00 inches in length and the shortest is approximately 0.038 inches in length. For example of the proper use of the Full Scale Range Label in relation to the Antenna Length and the Sensitivity Switch setting, refer to Figure 2.0 where the display is indicating a mid scale reading, the Sensitivity Switch is set to up ('HIGH') position and the short antenna is installed in the sensor. After identifying these conditions, refer to the Full Scale Range Label of Figure 3.0 which correlates to the 300 V/M cell within the table. This means the full scale indication for this condition is 300 V/M and the lower scale of the meter is to be used for obtaining the V/M reading. As a result, the actual V/M indication on the meter is 210 V/M.

Keeping all conditions the same in Figure 2.0 except replacing the short antenna with a long antenna, the actual indication would be 7.0 V/M if the long antenna was installed.

FULL SCALE RANGE			
Sensitivity Switch Pos.	Antenna Length		
	Long	Medium	Short
UP	10 V/M	100 V/M	300 V/M
DOWN	3 V/M	30 V/M	—

FIGURE 3.0

FULL SCALE RANGE LABEL

6.2 REAR PANEL

The following are descriptions of all the features located on the rear panel.

6.2.1 ' OUTPUT '

The ' OUTPUT ' jack produces an analog output of the sensor for remote monitoring. The analog output, in DC Volts, produces a zero to full scale indication in proportional voltage to the metering scaling by providing 0.0 VDC for zero scale indication to 5.0 VDC for a full scale deflection. Full scale deflection could be either 3.0 V/M or 10 V/M depending on the Sensitivity Switch position. The minimum impedance for the ' OUTPUT ' jack is 10 KΩ.

6.2.2 ' METER ZERO '

The ' METER ZERO ' is a potentiometer that is adjusted to obtain a "electrical" zero indication on the display. The ' METER ZERO ' operates only when the sensor is powered and operating. The meter should only be zeroed in an environment free of electronic fields.

6.2.3 Function Switch

The Function Switch is a three position switch with the up position representing 'CW' (Continuous Wave), the center position representing 'MONO PULSE' and the down position representing 'PULSE'. A brief description of each function is described below with further details described in Section 7.0, Operating Instructions.

6.2.3.1 'CW'

The CW or Continuous Wave position is for measuring, in volts per meter, electric fields that are continuously generated.

6.2.3.2 'MONO PULSE'

The Mono Pulse position is for measurements, in volts per meter, of a single pulse having a minimum duration of 1.0 usec.

6.2.3.3 'PULSE'

The Pulse position is for measurements, in volts per meter, of a pulse train with pulse widths greater than 1.0 usec and having a Pulse Repetition Frequency (PRF) greater or equal to 25 pulses per second (pps).

SECTION 7.0

OPERATING INSTRUCTIONS

To best understand the instructions provided below, it is recommended that the reader first becomes familiar with the features of the E Field Sensor that are detailed in Section 6.0, titled Functional Description.

7.1 Determine The Application

It is unhealthy for any meter to be pinned to the upper scale stops from excessive input for this may effect the calibration of a meter. To avoid this, review the following suggestions:

1) If the E Field intensity is known, select the proper antenna for the application using the correction factors of Table 1.0.

2) If there is some question to the intensity of the field to be measured, always use and antenna that is least sensitive and change antennas or sensitivity settings until the proper range is obtained.

7.2 Warm Up

It recommended where possible that the E Field Sensor be turned on and allowed to stand idle for 3 to 5 minutes.

7.3 Test Set Up Considerations

7.3.1 Electric Null Fields

Electric Null Fields, or E Null Fields, are a phenomena that may occur when the E Field Sensor is utilized in an application for EMI/EMC testing. In a typical EMI/EMC Set Up where an amplifier and a frequency generator are used to generate an E Field, a E Null Field can be noted when the generated E Field is swept through a frequency range and at certain frequencies the field level will drop. These nulls are due to antenna pattern nulls and/or out of phase reflections from screen room walls or other obstacles that cancel or nullify the generated E Fields at the precise location of the E Field Sensor. This phenomena is a natural occurrence and can be corrected by temporarily relocating the E Field Sensor for those specific frequencies where this phenomena occurred.

7.3.2 Antenna Types

An important consideration for measuring E Fields is understanding the direction or axis of the E Fields are being generated and the type of antenna required to measure those fields. The standard internal antennas provided with the E Field Sensor are uni-directional type antennas.

Uni-directional antennas can measure E Fields in only one plane and both the transmitting and receiving antennas must be in the same plane to operate properly. For example, a field generated in a horizontal plane would not be detected by an antenna positioned in the vertical plane, the resultant E Field level for this condition would be a null or zero reading. Respectively, a field generated in a vertical plane can be measured by an antenna in the vertical plane and the proper E Field level could be determined.

7.3.3 Antenna Orientation

As described in the Paragraph 7.3.2, the standard internal antenna provided with the sensor is an uni-directional antenna and is dependent to the axis or plane in which the field is generated. With the E Field Sensor in the normal position, free standing on the rubber feet, the antenna is in the vertical plane and is position to measure vertical E Fields.

To measure horizontal E Fields, turn the E Field Sensor on the side, placing the antenna in the horizontal plane, so that horizontal E Fields can be measured.

Note: *When measuring E Fields in the horizontal plane, take note that if a ground plane is used, you must isolate the sensor from the ground plane because the sensor chassis is a conductive material and may cause disturbance in the E Field measurement. Refer to Paragraph 7.3.4 for E Field Disturbance Considerations.*

7.3.4 E Field Disturbance Considerations

The E Field Sensor should be located in the field where the E Field disturbance can be minimized. To minimize a E Field disturbance, two considerations should be made, the distance from the sample being tested and the height of the sensor in the generated field.

To minimize the field disturbance, it is recommended the sensor be placed within the test area on a low dielectric constant material such as polyfoam. If the sensor is to be placed over a ground plane or any other metal surface, the polyfoam should be at least 2.0 inches thick.

The distance of the sensor to the sample being tested should be no closer than 3.0 inches. Tests have shown that these clearances are minimum requirements to insure insignificant E Field disturbances due to the presence of the field sensor assembly, when it is considered a foreign object to the test area.

7.4 Operation With Antennas

7.4.1 With the unit turned 'OFF' and placed on a level flat surface, verify that the meter exhibits a zero indication. If the meter requires adjustment, use the mechanical zero adjustment screw located on the lower middle section of the meter movement to obtain a zero indication.

NOTE: *If the LMT accessory described in paragraph 7.7 is used with the E Field Sensor, the LMT must be turned off before adjusting the mechanical zero on the meter. An operating LMT will adversely effect the mechanical zero adjustment of a non-operating E Field Sensor.*

7.4.2 Set the Power Switch to the 'UP' position while observing the conditions of Paragraph 7.2 herein. Verify that the operating sensor indicates a zero reading, if adjustment is necessary, adjust the 'METER ZERO' on the back of the sensor until a zero indication is obtained.

7.4.3 Install the desired antenna size into the threaded opening on top of the E Field Sensor by threading the antenna into the hole until the antenna is firmly seated. Do not use excessive force when seating the antenna. You may observe the meter will defect to full scale while the antenna is being installed. This is a normal condition and it could be used as a simple operational check, refer to Paragraph 5.4, Operational Check for more details

7.4.4 Place the sensor in the E Field as per the Typical Test Set-Up of Figure 5.0. Before a measurement can be taken it is important to verify the proper orientation of the antenna with respect to the plane of the generated signal. The generated signal can be produced in a horizontal or vertical plane and since the E Field Sensor is uni-directional and dependent on orientation with respect to the plane of the generated signal, the antenna has to be oriented in the same plane as the plane in which the field is generated. For more details refer to Paragraph 7.3.3. For example, refer to Figure 6.0 for proper axis orientation and Figure 7.0 for an improper axis orientation.

7.5 Using The Function Switch

As referred to in Paragraph 6.2.3, the Function Switch provides the user with the versatility of measuring three types of electric fields; Continuous Wave, Mono-Pulse and Pulse. The user must first determine the type of generated field to be measured in order to properly position the Function Switch in accordance to the field being measured.

7.5.1 Continuous Wave (CW) Setting

A Continuous Wave is a continuously generated electronic field, setting the Function Switch to the 'CW' position enables the sensor to measure, directly in V/M, the CW generated electronic fields.

7.5.2 Pulse Setting

A pulsed generated electronic field is a field that is not continuous in that the electronic field is interrupted into groups of pulses having a determined carrier frequency and pulse duration.

Setting the Function Switch to 'Pulse' position enables the sensor to measure pulsed electric fields, directly in volts per meter, provided the carrier frequency is above 1.0 MHz and the pulse width is above 5.0 microseconds. Should the determined pulse duration be between .05 and 5.0 microseconds, with the minimum carrier frequency of 1.0 MHz, the sensor frequency response begins to roll-off which is compensated by the aide of a Pulse Calibration Curve illustrated by Figure 8.0.

This Pulse Calibration Curve is provided so corrections can be made in the indicated sensor measurements in accordance to the generated pulse duration. The Pulse Calibration Curve of Figure 8.0 is a typical curve used for instructional purposes only, a Pulse Calibration Curve is unique to the individual characteristics of each sensor and an actual plotted curve is provided as a supplement to this manual.

For instructions on the use of the Pulse Calibration Curve, refer to Paragraph 7.5.4.

7.5.3 Mono-Pulse Setting

The Mono-Pulse feature operates identically to the Pulse Feature of Paragraph 7.5.2 however this setting is designed to store a single pulse or pulses and display the peak level of the generated pulse field. The sensor will store the peak level for approximately five (5) minutes before the stored peak level begins to discharge.

To select the Mono-Pulse position, it is recommended the Function Switch be switched from the CW position to the Mono-Pulse position. To clear to display, return the Function Switch to the CW position.

Care should be taken when using the Mono-Pulse feature in that when switching the Function Switch from the CW position to Mono-Pulse position, that there are no fields present and that the users hand is not near the antenna or the sensor may store a false pulse level.

7.5.4 Using The Pulse Calibration Curve

As described in paragraph 7.5.2, the Pulse Calibration Curve of Figure 8.0 is utilized when a generated pulse width is below 5 microseconds with a carrier frequency is greater than 1.0 MHz. When using this curve it is important to know the position of the Range Selector Switch because the response curve is different for each range position.

An example for using the Pulse Calibration Curve is as follows:

Having a condition with a known pulse field of 3 microseconds with a carrier frequency greater than 1.0 MHz, the E Field Sensor, being utilized in a typical application and having the Range Switch set to the High position, is indicating a 10 V/M reading. Since the sensor has a response roll off below 5 microseconds, the actual field level is higher than the indicated value on the sensor. The Pulse Calibration Curve of Figure 8.0 is utilized to determine the actual field being measured by providing the meter response loss, in percentage, so that loss could be calculated and added back into the indicated reading. For the described condition, Point 'A' on the Pulse Calibration Curve represents the position of a 3 microsecond pulse along the High Scale response curve. The corresponding Meter Response correction percentage is 3.5% meaning that the indicated meter reading of 10 V/M is 3.5 V/M less than the actual field being measured. To correct for this roll off, 3.5 V/M is added to the indicated meter reading resulting in the actual pulse field to be 13.5 V/M.

In using the same example except the with the Range Switch set to the Low Scale position, the 3 microsecond pulse now represents Point 'B' and a meter response correction of 11%. With the sensor indicating 3 V/M and having a meter correction of 11%, the actual field, after mathematical correction for the response roll off, is 3.33 V/M.

Each time the sensor is returned for calibration, as per Section 9.0, a new response curve is taken and provided in the data package.

7.6 The Light Modulating Transmitter (LMT) Accessory

The optional Light Modulator Transmitter (LMT) converts the measured E Field in to a modulated light source that is transmitted to a remote sensing device via a light pipe. The light pipe is provided with the LMT option.

7.6.1 Attaching The LMT

The LMT is attached to the base of the E Field Sensor as per Figure 4.0. using the provided mounting screw that passes through the LMT and threads into the base of the E field Sensor. The wire extending from the back panel of the LMT is attached to the 'OUTPUT' jack on the back panel of the E Field Sensor.

7.6.2 **Operation With The LMT**

To use the optional LMT turn on the LMT by switching the Power Switch to the 'ON' position. Insert the light pipe into the 'LIGHT OUTPUT' jack below the 'ON' switch and route the light pipe to the remote sensing device. Use the E Field Sensor / LMT combination normally as you would use the E Field Sensor by itself.

<u>Note</u>: When using the LMT Accessory, the standard E Field Sensor antennas <u>must</u> be replaced with the calibrated EFS/LMT Antennas provided with the LMT. The EFS/LMT antennas are compensated in length for the increased height of the E Field Sensor with the LMT attached. These antennas are identified by several means, a RED dot on the antenna container, the EFS and LMT part number and serial number are written on the container and the base of each individual EFS/LMT antenna is painted red. A RED DOT is placed on the front of the LMT to remind the user that the matching red color coded antennas are to be used.

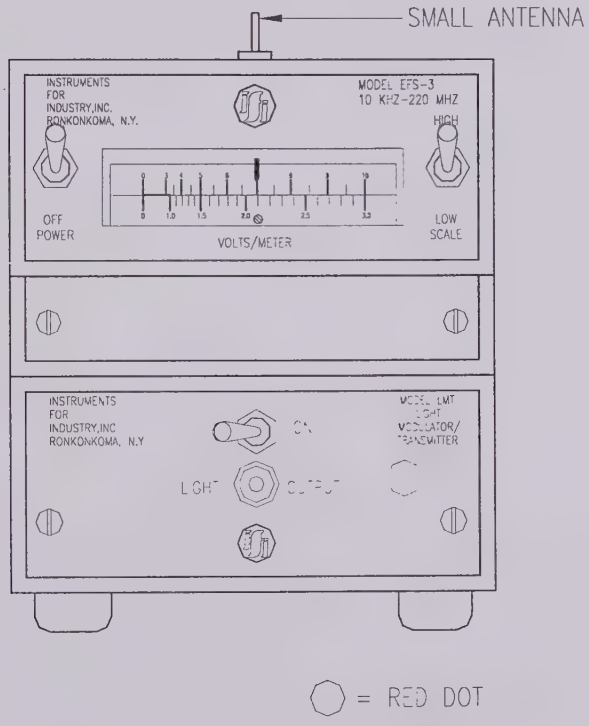


FIGURE 4.0

E - FIELD / LMT SENSOR COMBINATION

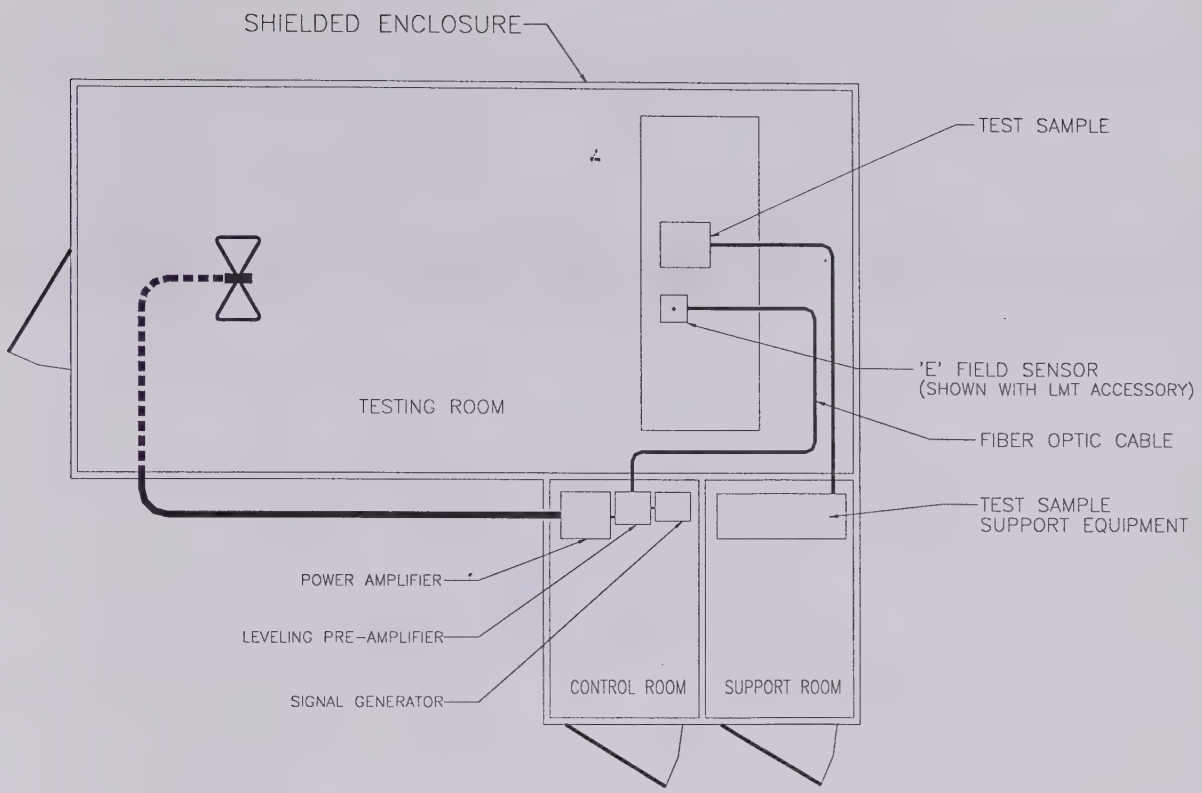


FIGURE 5.0

TYPICAL TEST SET-UP

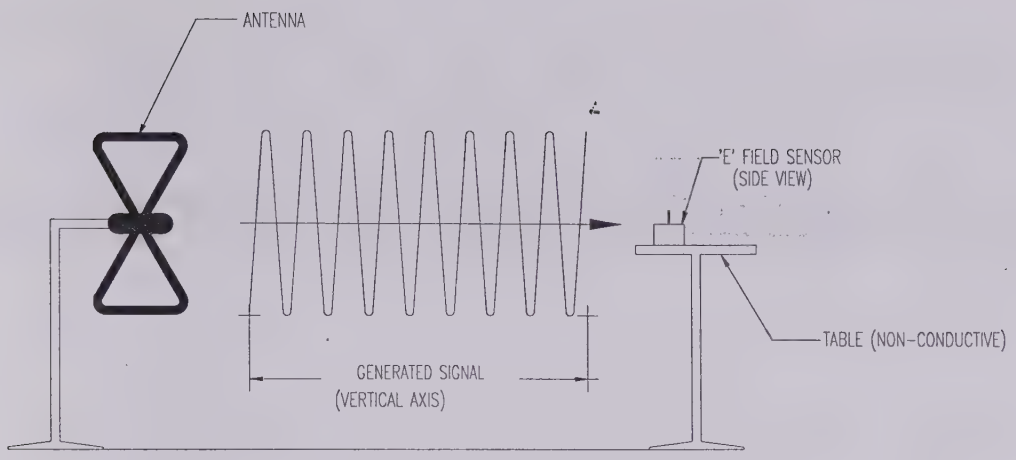


FIGURE 7.0
PROPER AXIS ORIENTATION

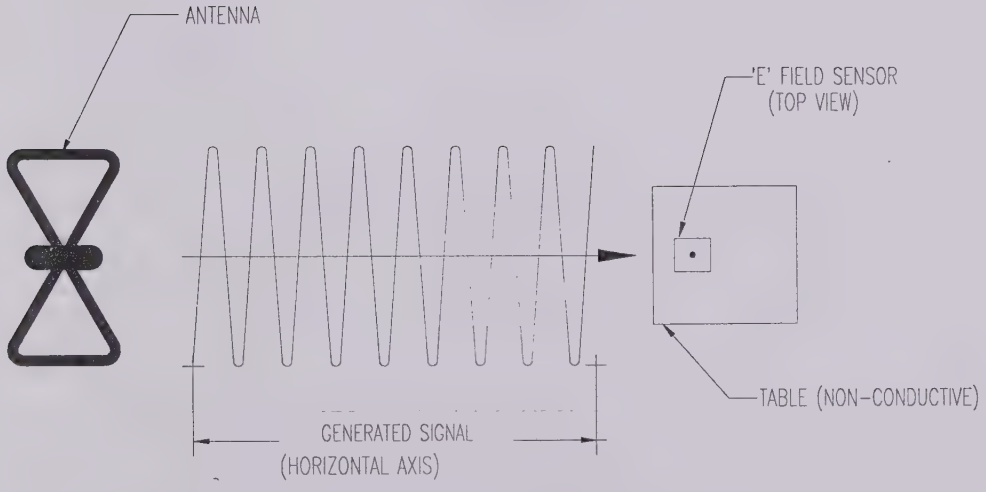
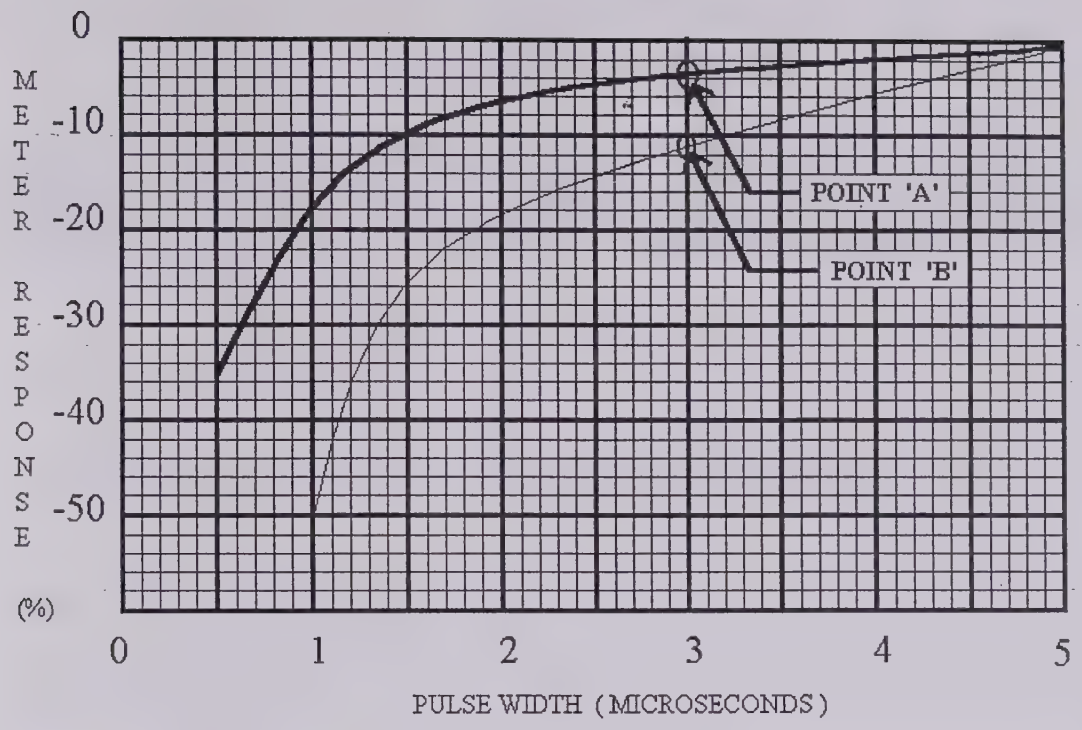


FIGURE 6.0
IMPROPER AXIS ORIENTATION



KEY: Bold Line = High Scale
Thin Line = Low Scale

FIGURE 8.0

TYPICAL PULSE CALIBRATION CURVE

SECTION 8.0

ACCESSORIES AND OPTIONS

It is difficult to mention all the possible accessories available to the EFS-3 E Field Sensor, however listed below are the basic and most common accessories available that Instruments For Industry, Inc. manufactures. It is recommended that if further accessories are required for the users' particular requirements, they should contact our Sales Department for option that best supports the users' requirements.

8.1 Light Modulator Transmitter (LMT)

The Light Modulator Transmitter (LMT) is a feature that attaches onto the EFS-3 and can be purchased separately.

The LMT in combination with the EFS-3 that converts the meter display indication to an optical signal and transmits that signal through a optical cable to a remote sensing device, examples of which are detailed in Paragraph 8.2. This feature not only allows the user to remotely operate the sensor within areas where a potentially hazardous Electromagnetic Radiation condition may exist but also allows remote monitoring that is not susceptible to Electromagnetic Radiation or Emissions.

The optical signal from the LMT can be converted for digital applications or applied to a frequency-to-voltage converter for analog indication and control.

8.2 Remote Sensing Devices

8.2.1 Light Demodulator Indicator (LDI)

The Light Demodulator Transmitter (LDI) is the complement for the LMT option described in Paragraph 8.1. The LDI is a remote sensor that receives the optical signal from the LMT output of the EFS-3 Sensor and converts the signal back into a analog meter reading. A light pipe or optical cable connects the LMT to the LDI.

8.2.2 Leveling Preamplifiers

Instruments For Industry, Inc. (IFI) manufactures a wide variety of LPA-5 Series Leveling Preamplifiers which are sophisticated devices too complex to describe in one paragraph, however the following is a simplified description of the relationship of the Leveling Preamplifier to the EFS-3 E Field Sensor.

An IFI manufactured Leveling Preamplifier is a computer controlled device that accepts the optical output of one or many E Field Sensors and controls the output level of a power amplifier to automatically maintain a programmed E Field intensity within a testing area based on the measured field intensity of one or more E Field Sensors.

The Leveling Preamplifier is part of a system that makes up the Typical EMI/EMC Testing Set-up of Figure 5.0. IFI sells and supports all equipment necessary to establish and operate a EMI/EMC facility.

SECTION 9.0

CALIBRATION CYCLES

The recommended calibration cycle for E Field Sensors are on a annual basis. Calibration of E Field Sensors at IFI is in full compliance to MIL-STD-45662A and are calibrated with NIST traceable equipment which in turn is annually calibrated by an MIL-STD-45662A approved off-site calibration facility.

All calibrated equipment is certified by a Certificate Of Calibration (C of C) which provides the date of calibration, part number, serial number, a statement of NIST traceablity, a statement of compliance to MIL-STD-45662A, the environmental conditions at time of calibration, a statement of whether the equipment was returned within, out of tolerance or in non-operational condition and the signature of the calibration technician. The equipment will also be returned with before and after data.

If an E Field Sensor requires calibration, follow the procedure outline in Section 10.0, Servicing Equipment, for instructions on how to return equipment for calibration. It is recommended that equipment is returned in accordance to Section 10.0 so the equipment can be repaired or calibrated and returned in a efficient and timely manner.

SECTION 10.0

SERVICING EQUIPMENT

Should such an event arise that the users' E Field Sensor requires repair or calibration, it is recommended that the reader follows the Equipment Return Procedure so the equipment can be repaired or calibrated and returned in a efficient and timely manner.

10.1 Equipment Return Procedure

10.1.1 Request a RMA Number

Contact the IFI Service Department either in writing or by calling (516) 467-8400 and ask for a Return Material Authorization (RMA) Number.

The RMA Number is the method IFI uses to prepare its' services for returned material in transit and acts as a tracking document for the returned material through the repair or calibration process.

The RMA also documents the readers' specific instructions or reason related to the return of the material.

10.1.2 Return All Accessories

In the interest of saving time and expediting the repair or calibration process, return all the associated accessories described in Section 1.0 when returning the sensor for repair or calibration.

In many cases, a faulty accessory could give an illusion that the sensor itself has failed. For this reason it is important to return the all the accessories with the sensor. It is also IFI's policy to verify performance of all associated accessories of Section 1.0 before returning the sensor to service.

10.1.3 Packaging The Sensor

When returning equipment to the manufacturer, always wrap each accessory separately and provide sufficient protective material around each item to prevent damage from handling and shipping conditions.

10.1.4 Reference The RMA Number

As detailed in Paragraph 10.1.1, always reference the IFI assigned RMA Number on your Packing List and Purchase Order and also when any inquiries are made.

SECTION II.0

2.3 SPECIFICATIONS

SECTION 11.0

EFS-3 SPECIFICATIONS

Frequency Range:	10 kHz to 220 MHz
Meter Accuracy:	< 5% Of Full Scale
Meter Scale:	Direct reading in volts per meter
Meter Zero:	Adjustable zeroing pot
Power:	Rechargeable NICAD Battery
Dimensions:	2.88 x 4.0 x 4.0 in (H x W x D)
Weight:	28 oz.
Compatibility:	Compatible with all accessories used with the EFS-1 , EFS-2 and EFS-5 E Field Sensors

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